

Gonorrhea Control Measures

—A Study in New Hanover County, N. C.—

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THE PAST DECADE has seen remarkable progress in the control of syphilis. Perhaps partly because of a lack of interest in the problem, the control of gonorrhea has not met with the same success (1-6).

Epidemiological Considerations

Except in a few isolated local areas, there is no true measure of incidence and prevalence of gonorrhea. In the fiscal year 1952, there were 245,633 cases of gonorrhea reported to the Public Health Service by the States (7). This was more than 20 times the number of cases of primary and secondary syphilis reported for the same year. Trends in morbidity reporting of primary and secondary syphilis and gonorrhea from 1943 through 1952 for the continental United States and for North Carolina are shown in figure 1.

In many respects, the epidemiology of gonor-

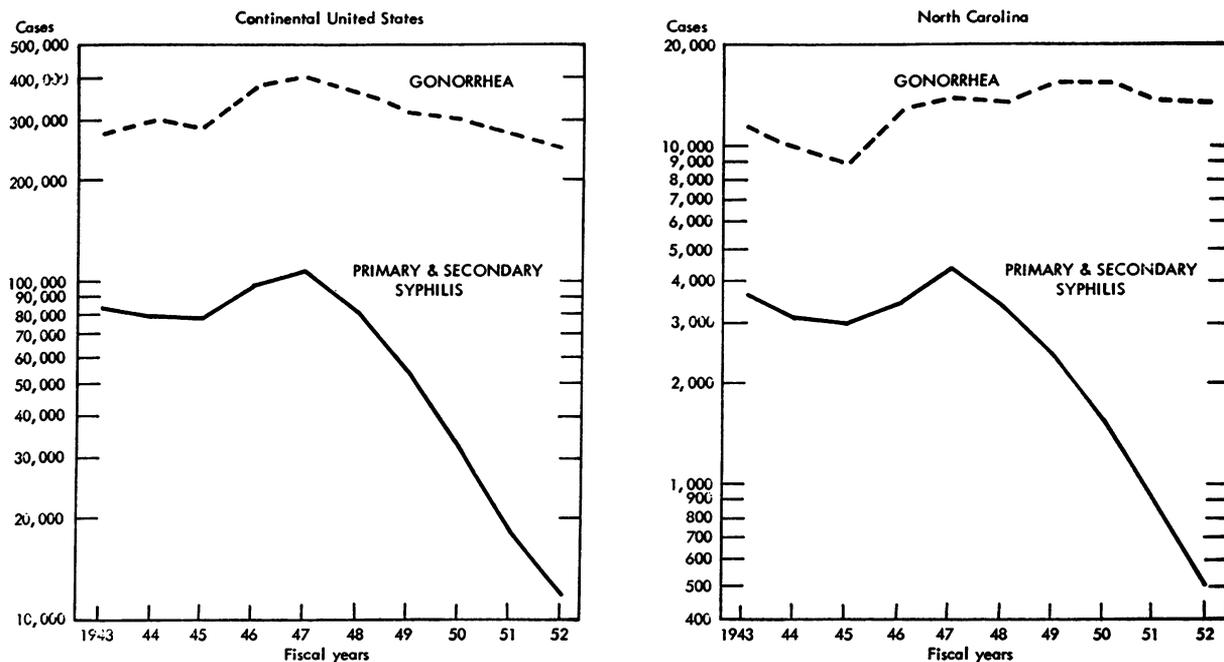
rhea should be simpler than that of any other communicable disease (8). The incubation period is short. Infection in the male may be suspected as soon as the urethral discharge appears, although in the female, evaluation is admittedly more difficult. There is essentially only one means of transmission, sexual intercourse. There is no intermediate host, and in most cases the source of infection should consist of only one other individual.

However, it is precisely at this last item that we may point the finger of suspicion. Effective interview of each male who seeks treatment should yield information leading to the female from whom the infection was obtained. Treatment of this female and any others exposed should be expected to result in control. On a somewhat larger scale, owing to the longer incubation period, this has been the mechanism which has led to the control of infectious syphilis.

From the data in table 1, it can be seen that we have failed to find many females who are harboring this infection. If it is assumed that a theoretical ratio of one infected female per male patient exists, then merely using reported morbidity, nearly 90,000 females who have this disease went untreated in fiscal 1952. There is, admittedly, some question of the validity of the assumption that an equal number of males and females have this disease, but the relationship must be fairly close to a unitary one. This large number of untreated and presumably in-

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Figure 1. Trends of primary and secondary syphilis and gonorrhea, fiscal years 1943-52.



fectured females constitutes a sizable army capable of transmitting an infectious disease. Durel (9), who also views this group as a reservoir, has stated: "French venereologists often say that the eradication of gonorrhea depends on the treatment of gonorrhea in the female."

In fiscal 1952, 6,948 males and 5,043 females were reported in the continental United States as having primary or secondary syphilis, a ratio of 0.73 females to 1 male. As is shown above, the ratio for gonorrhea was 0.46 females to 1 male. Can this difference in ratio be a clue to the relatively slow decline of gonorrhea in the United States?

Table 1. Reported cases of gonorrhea for the continental United States, fiscal years 1948-52¹

Fiscal year	Male	Female	Female/male ratio
1948-----	253, 947	109, 067	0. 43
1949-----	233, 484	98, 177	. 42
1950-----	214, 899	89, 093	. 41
1951-----	192, 515	77, 944	. 40
1952-----	167, 386	77, 834	. 46

¹ Data obtained from the Venereal Disease Program, Division of Special Services, Public Health Service.

Additional evidence of a possible source of failure is seen in the contact indexes for previously untreated gonorrhea, as reported by the Venereal Disease Program of the Public Health Service. For fiscal years 1950, 1951, and 1952, these indexes were 0.80, 0.83, and 0.91, respectively. If, at the very least, a single contact is not obtained from each male patient found to have gonorrhea, success cannot be achieved in controlling the disease.

Clinical Considerations

The diagnosis of genitourinary gonorrhea may be based upon:

1. The clinical appearance, the discharge in the male being most valuable from this standpoint.
2. A history of exposure, especially in a male patient when such exposure took place within 1 week prior to examination.
3. Examination of named contacts of the patient.
4. Gram stain of smears.
5. Culture and differentiation of organisms.
6. Complement-fixation test (rarely used).

There is no single simple test which may be performed rapidly and inexpensively to yield a definitive diagnosis. The diagnosis in the

male with a purulent discharge, a history of exposure, and a smear in which gram-negative intracellular diplococci are present, however, is relatively reliable and may be performed rapidly. Such an approach is without value for the female and is of limited usefulness for the male whose infection has become chronic. For these patients, the establishment of a definitive diagnosis is expensive and time-consuming (10-15).

Until 1943, when penicillin was added to the therapeutic armamentarium, the history of treatment of gonorrhea was largely one of sporadic hopefulness followed by failure and frustration (3, 16-19). At present, a single injection of penicillin in an absorption delaying medium is considered to produce complete cure in almost 100 percent of all cases (13), although an occasional patient may require retreatment with a higher dosage. Furthermore, there is evidence that oral penicillin taken shortly before or within a few hours after exposure will effectively prevent the development of gonorrhea (20). Some of the newer antibiotics have also been demonstrated as effective antigonococcal agents. However, penicillin remains the treatment of choice due to its ease of administration, low toxicity, high degree of effectiveness, and low cost.

Patients with gonorrhea come to diagnosis and treatment through three major case-finding measures (6, 21, 22):

1. Epidemiology or contact investigation, requiring administrative and field effort directed toward selected individuals (females).
2. Voluntary application following onset of symptoms or known or suspected exposure, requiring patient initiative and possibly motivated by "education" (males).
3. Routine physical and laboratory examinations, such as premarital, food-handler, and military, which may or may not be legally required (small numbers of both sexes).

In evaluating case-finding measures, considerable attention has been paid to the structure of the contact interview, to the kinds of contacts which should be investigated, and to the period of time which the interview should cover, but there has been surprisingly little discussion of a factor which is equally, if not more, important. This factor is the amount of time and

effort which should be devoted to locating named contacts. The elapsed time between obtaining investigative data and making a definitive diagnosis and providing treatment must be considered in dealing with a disease such as gonorrhea, which has a short incubation period. Any time lag means additional opportunity for dissemination of the infectious agent. Lack of attention to this factor may have some bearing on the apparent failure to control the disease.

The Study Area

A decision in July 1951 that action was necessary in an extracantonment defense area in North Carolina to reduce the incidence of gonorrhea provided an opportunity for a study of how control of this disease might be effected. The area comprised five counties: Onslow, Pender, Brunswick, Columbus, and New Hanover. Control measures were applied throughout the area but most completely in New Hanover County. Data for this report are derived from the experience in that county only.

New Hanover County, the smallest county in the State, is located in the tidewater area of southeastern North Carolina on the Cape Fear River. The 1950 census indicated a population of 63,272, composed of 43,430 whites and 19,842 nonwhites. The population of Wilmington, the county seat, was 45,043. The county population increase in the intercensal period 1940-50 was 32 percent. During World War II, there was a considerable influx of population due to the location nearby of two large military establishments, Camp Lejeune and Camp Davis, and the expansion of the shipyard in Wilmington to employ 23,000 workers. The latter two of these establishments were completely inactivated at the close of the war, but Camp Lejeune was re-expanded following the onset of the Korean conflict in June 1950.

From the standpoint of desirability for this study, the geographic isolation of the area is valuable. The nearest community comparable in size to Wilmington is Fayetteville, 90 miles away. The area within a 50-mile radius, largely a rural farm section, is sparsely populated.

Counteracting the favorable geographic location, however, is the mobility of some segments

of the population (23). The Marines stationed at Camp Lejeune, 60 miles from Wilmington, constitute one large mobile group. As Wilmington is the most readily accessible large town, it is widely used as a recreational area by the troops. The visitors to the beach resorts in New Hanover County during the summer months constitute a second large group. In addition, small groups of seasonal farm and fishing labor, merchant seamen and Coast Guard personnel, construction workers, the peripatetic waitresses, and the ever-present camp followers may be counted in the mobile population.

Venereal Disease Clinic

In Wilmington, there is a well-staffed city-county health department with a long history of effective public health work. The venereal disease control program has been in more or less continuous operation since 1918, with periodic assignment of full-time venereal disease control officers on loan from the Public Health Service. Here, as elsewhere, however, the emphasis has been on syphilis control, with little attention to gonorrhea.

Prior to the start of this study the venereal disease clinic was operated daily as part of a generalized clinic which included food-handlers, marriage license applicants, and others in its caseload. Patients often were required to wait an hour or more before being seen by the physician. Diagnosis and treatment of gonorrhea were based on clinical evidence or a single smear for males and a culture for females. Little or no treatment was given on the basis of epidemiological evidence. There was little effort expended to interview gonorrhea patients or to investigate their contacts.

Gonorrhea Rates

The reported gonorrhea morbidity rates per 100,000 population for New Hanover County for 1950 and 1951 were:

	1950	1951
White.....	52	202
Nonwhite.....	4,349	6,410
Total rate.....	1,400	2,149

The striking difference in rates for the two racial groups may be attributed in part to greater utilization of clinic services by the nonwhite population and perhaps to somewhat less

morbidity reporting for white patients seen by private physicians. Even though these factors are taken into consideration, however, the morbidity rate for the nonwhite population is much higher than that for the white.

Cultural factors which keep the white and nonwhite groups largely separate in their sexual activity provide two distinct groups for control purposes. Because of the greater utilization of the clinic by the nonwhite population, that group is especially valuable for this study.

Control Procedures

The study was designed to test the following hypotheses: Lack of treatment of infected females is the largest single cause of failure to control gonorrhea. Interview of male patients for contacts followed by rapid investigation of exposed females and treatment of those females on epidemiological evidence only may be expected to result in a decrease in male morbidity. As the female reservoir is decreased, morbidity for both sexes may be expected to decline. Effectiveness of gonorrhea control is therefore directly related to the ability to reduce the existing female reservoir.

The study period was designated as July 1951 through June 1952, and the following procedures were adopted:

1. To achieve better patient flow and to make clinic attendance more attractive to patients, clinic facilities, including physical arrangements, personnel responsibilities, and clinical procedures, were reorganized. Special attention was paid to developing efficient and courteous relations with patients.

2. For all male patients, the diagnosis of gonorrhea was based on a history of exposure, symptoms, and clinical evidence. To validate this method of diagnosis, smears were made from 100 consecutive male patients, stained by Gram's technique, and read by two experienced technicians for presence of gram-negative intracellular diplococci. All male patients were subjected to a rapid interview to elicit sexual contacts made during a period of 3 weeks prior to onset of symptoms.

3. For female patients, a diagnosis of "epidemiological gonorrhea" was made based on information obtained from interviews. Where

clinical evidence of infection was present (for example, salpingitis, Bartholinitis), a diagnosis of "clinical gonorrhea" was made. Only those females for whom a diagnosis of clinical gonorrhea was made were interviewed for sexual contacts. The interview period for those cases was established as covering 1 month prior to date of diagnosis.

4. All patients for whom a diagnosis of gonorrhea was made were interviewed for educational purposes. An attempt was made to give each patient a basic understanding of the disease for which he was treated, and he was given literature about the venereal diseases. Patients treated on epidemiological evidence only were informed that they had been exposed to the disease and that treatment was indicated as a protective measure. When the interviewer was unable to answer the patient's questions satisfactorily, the patient was referred to the physician for further explanations.

5. When information concerning contacts was adequate to warrant investigation, investigation was made the same day the information was obtained, and contacts were referred to the next daily clinic. Since rapid investigation was considered to be a key item in the study, considerable emphasis was placed on this phase of activity.

6. Efforts were made to encourage private physicians to report gonorrhea cases and to permit these patients to be interviewed for contacts. For this reason, personal visits were made to the two hospitals and to most of the private physicians in the county.

7. Public education was undertaken through group meetings, especially meetings of the parent-teacher associations. Joint meetings were held with juvenile court authorities and parents of high school students reported as venereal disease patients and contacts. These meetings were directed at alerting the parents to the problem and offering assistance in dealing with it.

8. Vigorous efforts were made to suppress prostitution and "pick-ups." Tavern owners and hotelkeepers were asked to cooperate by discouraging women from hanging around their establishments and by helping to locate contacts. Considerable support and publicity were obtained from local newspapers and civic groups.

9. Action was taken to eliminate drugstore and other unethical treatment. Cooperation of pharmacists was solicited by mail and through personal visits.

10. A daily clinic to detect venereal disease was held in the county jail. All female prisoners arrested on vice charges were offered 600,000 units of penicillin intramuscularly as a prophylactic measure. These patients were not included in reported morbidity.

11. In April and May 1952, 135 males and 60 females consecutively diagnosed as having gonorrhea were interviewed, and their clinic records were reviewed to corroborate and substantiate the interview material. Information was obtained about (a) previous infections, (b) drugstore and self-medication, and (c) duration of symptoms prior to seeking treatment.

12. Data were obtained from Camp Lejeune, including (a) gonorrhea rates and (b) contacts, with place of encounter and residence of contact.

13. The size of the investigative staff was increased from 1 to 2 persons in August 1951 and to 3 persons in December 1951. In May 1952, one of these was transferred out of the area because of a shortage of personnel elsewhere.

Effect on Morbidity Among Males

Effectiveness of the control measures can be evaluated to some extent through a review of changes in male morbidity prior to and during the study period. The number of gonorrhea cases reported for nonwhite males and females each month from January 1951 through September 1952 is shown in table 2; 6-month totals and average monthly morbidity within each 6-month period for nonwhite males is shown in table 3.

The overall decrease in morbidity for the males recorded during the study period is probably an underestimation of actual results because at the same time that efforts were being made to reduce morbidity, the following factors were operating to increase reported morbidity.

1. Increased reporting by private physicians. The morbidity data for the study period include from 3 to 5 male patients per month who were not clinic patients.

Table 2. Reported cases of gonorrhea among nonwhite population in New Hanover County, N. C., January 1951–September 1952

Year and month	Male	Female
<i>1951</i>		
January.....	74	20
February.....	37	8
March.....	64	7
April.....	91	18
May.....	65	17
June.....	113	26
July.....	69	63
August.....	57	62
September.....	74	52
October.....	71	54
November.....	67	59
December.....	60	44
<i>1952</i>		
January.....	50	56
February.....	40	42
March.....	51	41
April.....	52	46
May.....	56	26
June.....	55	39
July.....	79	34
August.....	61	56
September.....	63	47

2. Active measures against drugstore treatment. In July 1951, 10 percent of the patients seen in the clinic reported previous drugstore therapy; in April 1952, less than 3 percent reported such treatment. During the study period, several druggists referred patients to the clinic.

3. Improved availability of clinic services. Average daily clinic attendance doubled within 1 month after the clinic was reorganized and continued to increase slowly thereafter.

As may be seen from the data in figure 2, there was an upward trend in morbidity for the male group beginning early in 1950 and continuing until a peak was reached in April to June 1951. Expansion of Camp Lejeune undoubtedly contributed to this increase. A notable fact, however, is the absence of any marked change in female morbidity prior to July 1951. In that month, a precipitous rise occurred in morbidity reported for females as the study period began. As increasing numbers of females were brought to treatment, male morbidity declined, at first sharply, then more slowly. The decrease in male gonorrhea continued until the spring of 1952.

Unfortunately, beginning in April 1952 three

problems arose which forced relaxation of controls. The loss of one investigator and the replacement of another by a trainee resulted in a reduction in interviewing and investigative efficiency. At approximately the same time, the beach resorts opened for the season. Information relative to contacts from the beach areas proved to be particularly inadequate for investigative purposes. This was especially true at the start of the season. In June, the author was reassigned, and no replacement was available for several weeks, causing a temporary decrease in clinic services. During this period it was possible to demonstrate the effect of partial removal of controls; as seen in table 2 and figure 2, female morbidity went down and male morbidity rose.

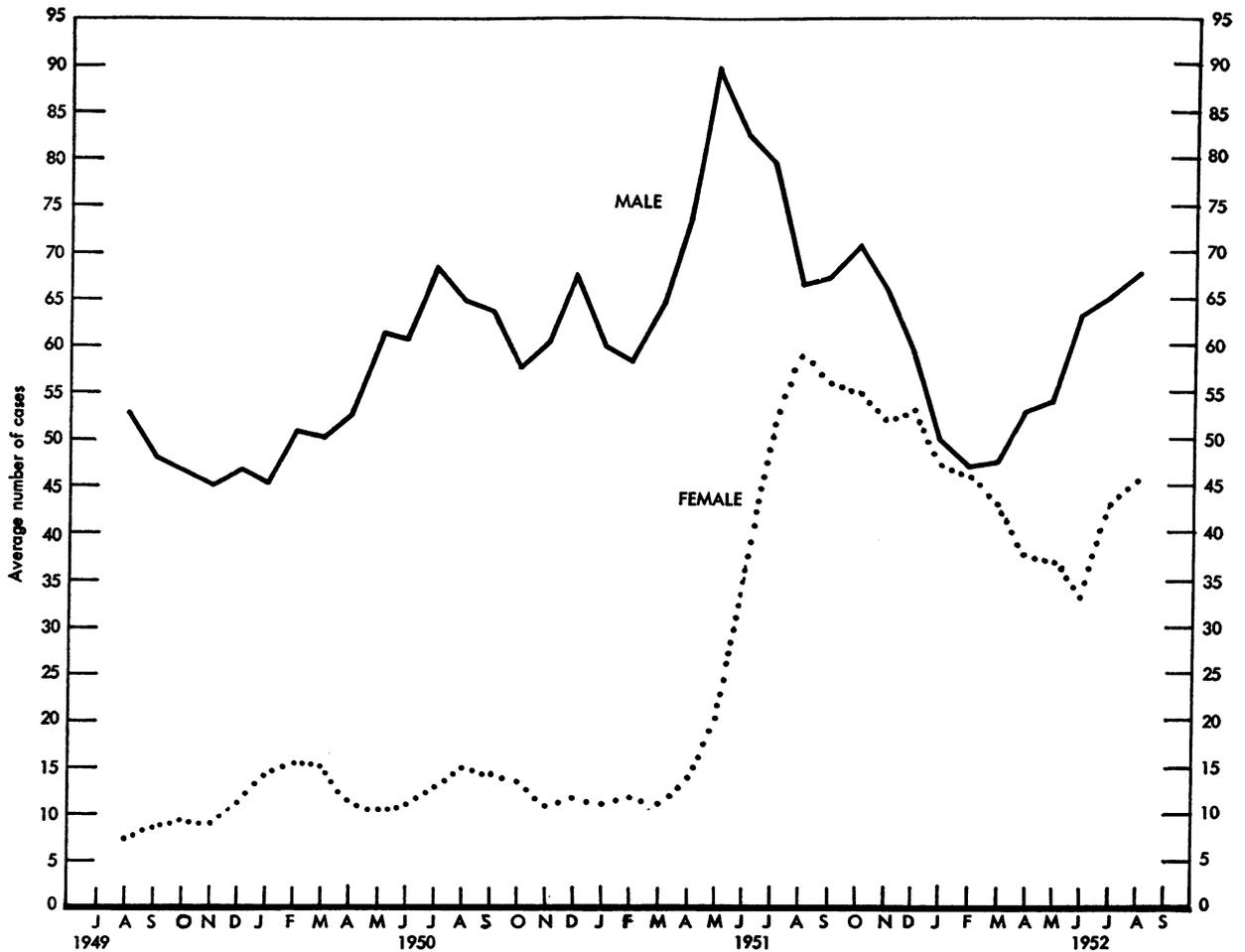
Since treatment of females on epidemiological evidence was the cornerstone of this study, it was desirable to validate the diagnosis of the males to whom these females were exposed. If the males did not actually have gonorrhea, morbidity figures for females would be highly inaccurate. Therefore, smears were made of urethral discharges from 100 consecutive male patients for whom a diagnosis of gonorrhea was entered. Ninety-nine of these smears were read as positive for the presence of gram-negative intracellular diplococci by two technicians. The patient from whom a negative smear was obtained had taken sulfathiazole for 24 hours before attending the clinic. This would have destroyed any susceptible gonococci if they had been present. The results obtained from this sample were considered as substantiating the validity of clinical diagnosis in the male.

For statistical purposes, data for the 6-month period preceding the study (January through June 1951) were used as a baseline in evaluating the study period. The ratios of female to male

Table 3. Reported cases of gonorrhea among nonwhite males in New Hanover County, N. C., January 1951–June 1952

Date	Number of cases	Average monthly morbidity
January–June 1951.....	444	74.0
July–December 1951.....	398	66.3
January–June 1952.....	304	50.7

Figure 2. Gonorrhea morbidity among nonwhite population, centered 3-month moving average, New Hanover County, N. C., July 1949–September 1952.



patients reported was 0.216 for the 6 months preceding the study and 0.831 for the study year. It is interesting to note that the latter is not far from the theoretical unitary relationship suggested in an earlier section.

Contact Information and Investigation

The number of contacts obtained and the number and percentage of these brought to treatment for the 6 months preceding the study and for the study year are shown in table 4. The contact indexes for these three 6-month periods were 1.23, 1.46, and 1.50, respectively. During the study year, a significantly higher proportion of the contacts were brought to treatment. The contact index was highest (1.55) for the 3-month period April through June 1952, but the percent brought to treatment

during this period returned to the prestudy level (64.0 percent). These figures indicate that the relaxation of control was due to inability to locate named contacts rather than to loss of interviewing efficiency or treatment failure.

As was previously noted, obtaining contacts through interview and bringing these contacts

Table 4. Contacts of gonorrhea patients, New Hanover County, N. C., January 1951–June 1952

Date	Number of contacts	Number brought to treatment	Percent brought to treatment
January–June 1951.....	165	103	62.4
July–December 1951.....	480	390	81.3
January–June 1952.....	346	265	76.6

to treatment through investigative activities is an inadequate control measure unless these contacts are brought to treatment rapidly. They already have had time to disseminate the disease before they are named as contacts; any delay will lead to further spread. During the study period, approximately 80 percent of all contacts eventually brought to treatment were treated within 48 hours after they were named, and more than 90 percent were treated within 5 days.

It may well be that obtaining sex contacts by interview can be more sharply limited in relation to the presumed infectious period. This will be possible, however, only if there is no significant loss of infected contacts. The 3-week period chosen for this study was an arbitrary selection. Further trial is necessary to determine if 10 or even 5 days will be adequate.

In addition, it is important to learn when a given investigation is not worth further expenditure of time. As a communicable disease comes under increasing control, the cost per case found tends to rise. Careful study is needed to determine the point where the effort required is greater than the potential value of finding the case.

In spite of the relative effectiveness of the control measures applied, the failure of the program to produce a greater decrease in gonorrhea morbidity emphasizes the need for more nearly complete reporting of morbidity and for improved interviewing and investigating techniques.

Morbidity Among the Military

Since the control program was in operation throughout the five-county extracantonment area, a decrease in gonorrhea morbidity in the civilian population should be expected to result in reduced morbidity among military personnel at Camp Lejeune. According to data compiled by the Public Health Service representative at the camp, shown in the tabulation below, the gonorrhea rate per 1,000 population for nonwhite troops decreased significantly. This reduction, however, can be credited only in part to the extracantonment control program, because intensive efforts to educate the troops

were being applied concurrently by military authorities.

Date	Number of cases per 1,000 population
January-June 1951.....	270
July-December 1951.....	201
January-June 1952.....	162

Another measure of the effectiveness of the control program outside the camp is reflected in military contact information. More precisely, inasmuch as New Hanover County was the area of most intensive control activity, a relative decrease in gonorrhea contacts named by military personnel as encountered or resident in that area should be anticipated. This was found to be the case, as is shown by the data in table 5.

Factors Hampering Control

Two of the factors which hamper efforts to control gonorrhea are the lack of immunity following infection and the failure of infected males to come to diagnosis and treatment when symptoms first appear. The data obtained in April and May 1952 from 135 consecutive male patients and 60 consecutive female patients, shown in tables 6 and 7, indicate the contribution of these two factors. Because of the presumably greater validity of history and clinical diagnosis for the male patients, discussion will be confined largely to this group.

Eighty percent of the 135 male patients had been previously infected at some time with gonorrhea, and 65 percent of the repeaters had had at least one previous infection within the pre-

Table 5. Gonorrhea contacts named by military personnel at Camp Lejeune, N. C., January 1951-June 1952¹

Date	Number of contacts	Number of contacts in New Hanover County	Percent of contacts in New Hanover County
January-June 1951----	459	103	22.4
July-December 1951---	465	65	14.0
January-June 1952----	618	76	12.3

¹ Data compiled by the Public Health Service representative at Camp Lejeune, N. C.

Table 6. History of previous infection among clinic patients, New Hanover County, N. C., April–May 1952

Previous infection history	Male	Female	Total
Total	135	60	195
Previous infection	108	28	136
No previous infection	27	32	59
Previous infection during preceding year	70	20	90
1 episode	41	10	51
2 episodes	21	3	24
3 episodes	8	2	10
More than 3 episodes	0	5	5

Table 7. Percentage of 135 male gonorrhea patients reporting to clinic within specified time periods following onset of symptoms, New Hanover County, N. C.

Days	Patients previously infected (percent)	Patients not previously infected (percent)
2 or less	54.6	51.9
3 to 5	39.8	37.0
More than 5	5.6	11.1

ceding year. No significant difference was found between the percentage of male patients who had had previous infections and the percentage of those with first infections reporting to the clinic within specified time periods following onset of symptoms.

Apparently, previous infection does not exert any significant influence in inducing males to avoid infection or to seek immediate treatment. The results of this aspect of the study cast some doubt on the effectiveness of the methods used to educate the male to avoid infection or to come to treatment promptly when symptoms of infection appear. Since the patients in this group were interviewed in the spring of 1952, many of the repeaters had been exposed to educational efforts in the clinic only a few months before. It was rather disheartening to see them reappear so soon.

In addition to the data in the above tables, no significant difference was found between repeaters and first infections as to either self-medication or drugstore treatment prior to re-

porting to the clinic. The sample was very small, however.

For each male interviewed, the female contacted 3 to 6 days prior to onset of symptoms was designated as the "probable source of infection." No significant difference was found between the number of repeaters and the number of first infections who named casual pickups. Somewhat disturbing, however, was the fact that all of the eight patients who named paid prostitutes as the probable source of infection were repeaters.

It is evident that the repeater will present a continuing problem in the control of gonorrhea. However, a reduction in the size of the reservoir, such as that achieved for infectious syphilis, may be expected to result in a decrease in the number of repeaters. An adequate procedure for education of the individual patient is not yet at hand. It is hoped that further research into the field of human behavior will provide more effective tools for the accomplishment of this objective.

Summary and Conclusions

Morbidity data for gonorrhea indicate that efforts to control this disease during the past decade have met with little success. Although there are gaps in existing knowledge concerning this disease, the failure to effect more adequate control may be attributed in part to incomplete application of present knowledge. Until more reliable tests are available for diagnosing gonorrhea in the female, the infected male must be the source of information leading to other infected individuals.

The gonorrhea control program initiated in July 1951 in New Hanover County, N. C., provided an opportunity for a year's study of the effects of rapid investigation and treatment on the basis of epidemiological evidence of female contacts named by male patients on the trend in morbidity. Until controls were relaxed in the spring of 1952, the program produced a decline in male morbidity, followed by a smaller decline in female morbidity. Failure to effect a greater decrease in morbidity emphasizes the need for increased reporting of gonorrhea cases and for improved interviewing and investigating techniques.

Important to the success of a gonorrhea control program is the cooperation of several groups, including infected persons, private physicians, pharmacists, clinic personnel, and civic groups. Their cooperation is best obtained by providing each group concerned with an understanding of the problem and of specific steps which must be taken to deal with it.

The results of interviews of 135 males concerning previous infection and duration of symptoms prior to seeking treatment indicate a need for improved educational techniques. In particular, the repeater remains a source of difficulty. Further research in the field of human behavior may result in the development of more effective techniques for dealing with the overall problem of promiscuity.

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